

CHARGE SCREENING IN ELECTROSTATICALLY DRIVEN DEVICES

We claim:

1. A method for use in making an electrostatic driving structure for an electrostatically driven device, the electrostatic driving structure having a first electrode in a first area of a surface of a dielectric and a second electrode in a second area of the surface of the dielectric that is spaced apart from the first area so as to define a gap on the dielectric surface between the first electrode and the second electrode, the method comprising:
 - 5 disposing a first electrostatic shield made of non-insulating material on the electrostatic driving structure adjacent the gap; and
 - 10 electrically coupling the first electrostatic shield to a source of potential.
2. The invention of claim 1, further comprising disposing a second electrostatic shield made of non-insulating material on the electrostatic driving structure adjacent the gap and electrically coupling the second electrostatic shield to a source of potential.
- 15 3. The invention of claim 1, wherein the first electrostatic shield is made of metal or a semiconductor.
4. The invention of claim 3, wherein the first electrostatic shield is disposed on the electrostatic driving structure by electroplating, electroless plating or vapor deposition.
- 20 5. The invention of claim 1, further comprising disposing a shape-controlling structure on the electrostatic driving structure prior to disposing the first electrostatic shield, so that the shape of the first electrostatic shield formed is controlled by the shape of the shape-controlling structure.
6. The invention of claim 5, wherein the shape-controlling structure comprises a layer of material disposed on the electrodes and the gap, having an opening in the layer exposing an area of the electrostatic driving structure.
- 25 7. The invention of claim 6, wherein disposing the first electrostatic shield comprises disposing non-insulating material on the exposed area of the electrostatic driving structure to a thickness less than the thickness of the shape-controlling structure adjacent the opening, and then removing the shape-controlling structure.
8. The invention of claim 6, wherein disposing the first electrostatic shield comprises 30 disposing non-insulating material on the exposed area of the electrostatic driving structure to a thickness greater than the thickness of the shape-controlling structure adjacent the opening, and then removing the shape-controlling structure.
9. The invention of claim 5, wherein the shape-controlling structure comprises a layer of resist.
- 35 10. The invention of claim 1, wherein the source of potential is the first electrode.
11. The invention of claim 1, wherein the first electrostatic shield includes a portion disposed on the dielectric material in the gap.
12. The invention of claim 1, wherein the first electrostatic shield includes a portion disposed on the first electrode adjacent the gap.

13. The invention of claim 12, wherein the first electrostatic shield includes a portion disposed on the dielectric material in the gap.

14. The invention of claim 12, wherein the first electrostatic shield includes a portion extending away from the first electrode, in a direction normal to the surface of the first electrode, a distance that is at least about the lateral extent of the gap between the first electrode and the second electrode.

15. The invention of claim 12, wherein the first electrostatic shield includes a laterally extending portion that extends away from the first electrode, in a direction generally parallel to the surface of the first electrode, so as to overhang at least a part of the gap.

10 16. The invention of claim 15, wherein substantially the entire gap is overhung by laterally extending portions of one or more electrostatic shields.

15 17. An electrostatically driven device including an electrostatic driving structure having a first electrode in a first area of a surface of a dielectric and a second electrode in a second area of the surface of the dielectric that is spaced apart from the first area so as to define a gap on the dielectric surface between the first electrode and the second electrode, further comprising a first electrostatic shield, the first electrostatic shield being made of non-insulating material, disposed on the electrostatic driving structure adjacent the gap, and electrically coupled to a source of potential.

18. The invention of claim 17, wherein the source of potential is the first electrode.

20 19. The invention of claim 17, further comprising a second electrostatic shield that is made of non-insulating material, disposed on the electrostatic driving structure adjacent the gap, and electrically coupled to a source of potential.

20 20. The invention of claim 19, wherein the source of potential is the second electrode.

25 21. The invention of claim 17, wherein the first electrostatic shield is made of metal or a semiconductor.

22. The invention of claim 17, wherein the first electrostatic shield includes a portion disposed on the dielectric material in the gap.

23. The invention of claim 17, wherein the first electrostatic shield includes a portion disposed on the first electrode adjacent the gap.

30 24. The invention of claim 23, wherein the first electrostatic shield includes a portion disposed on the dielectric material in the gap.

35 25. The invention of claim 23, wherein the first electrostatic shield includes a portion extending away from the first electrode, in a direction normal to the surface of the first electrode, a distance that is at least about the lateral extent of the gap between the first electrode and the second electrode.

26. The invention of claim 23, wherein the first electrostatic shield includes a laterally extending portion that extends away from the first electrode, in a direction generally parallel to the surface of the first electrode, so as to overhang at least a part of the gap.

27. The invention of claim 26, wherein substantially the entire gap is overhung by laterally extending portions of one or more electrostatic shields.

28. The invention of claim 17, wherein the cross-section of the first electrostatic shield is generally rectangular.

5 29. The invention of claim 17, wherein the cross-section of the first electrostatic shield is generally mushroom-shaped.

30. The invention of claim 17, wherein the electrostatically-driven device is an optical cross-connect, an oscillator, a comb drive, or a modulator.

10 31. An electrostatic shield made of non-insulating material coupled to a first electrode on the surface of a dielectric material, the first electrode being separated from a second electrode on the surface of the dielectric material by a gap.

32. An electrostatically driven device having means for electrostatically driving a moveable member, the electrostatic driving means comprising:

first electrode means disposed in a first area of a surface of a dielectric;

15 second electrode means disposed in a second area of the surface of the dielectric that is spaced apart from the first area so as to define a gap on the dielectric surface between the first electrode means and the second electrode means; and

20 electrostatic shield means for reducing the effect on the moveable member of mobile charges on or in the gap, the electrostatic shield means being made of non-insulating material, disposed on the electrostatic driving structure adjacent the gap, and electrically coupled to a source of potential.